



## PATHOLOGICAL CHANGES IN CHRONIC ALCOHOLISM.

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Read before the American Association for Study and Cure of Inebriety, at its regular meeting, December 4th, 1888.

If we consider the serum of the blood in the habitual drunkard as an alcoholized fluid, and that alcohol existing in a certain percentage in the serum acts not only upon the serum of the blood but also upon its anatomical elements, we have a condition that modifies nutrition, producing metamorphosis and degeneration of tissue. If, in connection with this, we add the fact that alcohol, *per se*, is an irritant, producing modification as well as degeneration of tissue independent of blood changes, we have an additional reason to regard alcohol as a disease producing agent.

We have then to study the pathological effects produced by alcohol on the blood from two standpoints :

*First.*—As to its effect on the blood itself.

*Secondly.*—The direct effect of the alcohol in the alcoholized blood or serum upon the tissues of the body.

It would be of interest to determine to what extent the serum of the blood can take up alcohol. That it does so, in common with the other fluids of the body, there can be no doubt. Blood taken from an habitual drunkard, and exposed to heat, will give off the fumes of alcohol. At autopsies on drunkards, the fluid in the ventricles of the brain has been ignited with a match.

There is good reason to warrant the conclusion that not only the serum of the blood, but also the fluid of the ventricles and the cerebrospinal fluid, in the case of habitual drunkards, contain alcohol to a greater or less extent, in some cases probably as much as is compatible with life. A series of chemical analyses, to determine the average percentage of alcohol in the blood of habitual drunkards, would be of extreme interest. The blood in such a condition has not only its nutritive properties very much impaired and its oxygenation and circulation retarded, but as a builder up of tissue it must be very inferior to normal blood ; in fact, it is a disintegrator of tissue. The urine of the habitual drunkard contains a certain percentage of alcohol. The application of heat or the proper chemical tests for alcohol if applied, prove this. Indeed, if we test the urine of an abstainer within a reasonable time after he has taken alcohol, the chromic acid test will show the characteristic reaction. The effort to prove that the milk of nursing mothers, using beer or other alcoholic beverages, did not contain alcohol, has resulted in failure. The toxic effect on the infant is shown

in the moderate alcohol coma it experiences after nursing, and where the mother was intoxicated the convulsions that ensued.

The experiments of M. Lallemand, Duroy and Perrin seemed to demonstrate that alcohol received into the body was eliminated by the lungs, the kidneys and the skin, completely and as alcohol, and that if it was retained in the tissues it was not transformed.<sup>1</sup> The experiments of Anstie on the other hand disprove this. "While a certain proportion of the alcohol ingested is excreted by the lungs, kidneys and skin, a certain proportion is broken up in the blood and transformed into some other substance, probably aldehyde," just as aldehyde shortly after its administration is transformed in the blood into acetic acid. But this does not weaken the practical fact that alcohol is present in all the fluids of the body, passes through all the excretory organs, acts directly upon the nervous system and other tissues of the body, producing its deleterious effects either as alcohol or some transformation of it equally pernicious. The degeneration and alteration of tissue in chronic alcoholism is due to the following causes:

*First.* An impoverished, alcoholized blood, imperfect in its oxygenation and retarded in its circulation, and, consequently, producing mal-nutrition.

*Secondly.* The direct irritating effects of alcohol contained in said blood.

*Third.* The degenerating effects of alcohol on the nervous centres, producing vaso-motor paralysis and impaired reflex action.

The latter is regarded by some writers as the primal and most potent cause of general alcoholic degeneration. The principal tissue changes in chronic alcoholism are fatty, fibroid and atrophic.

The most marked examples of alcoholic fibrosis are found in the lungs, kidney and liver.

In the lungs, as alcoholic phthisis, a chronic interstitial pneumonia; in the liver as cirrhotic, gin or hobnail liver; in the kidney as cirrhotic, hard or contracted kidney. These fibroid changes are slow, may take years to form, but they are rapid in the latter stage. In syphilis we may resolve a gumma or modify the lesions of the tertiary stage. In pulmonary tuberculosis we may be fortunate enough to secure cicatrization of cavities, or hold the disease in check; but the lesions of chronic alcoholism are progressive, and, when once fully established, irremediable, whether in the lungs, kidney or liver.

The effect of chronic alcoholism on the generative functions in both sexes is instructive and interesting

"Lippich<sup>2</sup> has demonstrated that alcoholized marriages produce two-thirds less children than among those who were temperate. There can be no doubt that alcoholism affects the generative function of

<sup>1</sup> "Stimulants and Narcotics." Anstie.

<sup>2</sup> "Alcoholic Heredity." Dr. F. Lentz, Med. Director of Insane Asylums, Tournai, Belgium.



both sexes. The testicles undergo degeneration in alcoholized persons. The spermatic fluid shows this in the well marked changes it exhibits, robbing it of the vitality indispensable to conception."

"The alcoholic cachexia after it has attained sufficient intensity will produce this, although the organs themselves may not be diseased. Many examples of women are noted who have had children by their first marriage whose subsequent union was barren with an alcoholized husband and also the reverse. Women may become sterile by alterations of the ovaries and matrix, and abort before maternity. From this point of view alcoholism is a more serious trouble in the mother than in the father."

Drs. Mairét and Combernal recently presented some experiments on the hereditary influence of alcohol before the Academy of Sciences of Paris.

A healthy bitch was made a chronic alcoholic, and gave birth to twelve puppies; two were still-born, three died by accident, and the remaining seven died of epileptic attacks, enteritis, pulmonary and peritoneal tuberculosis. The lesions found at the post-mortems were thickening of the bones, fatty degeneration of the liver, adhesion of the dura mater, and other marked alcoholic changes.

A strong bitch was kept intoxicated on absinthe the last three weeks of gestation. Six puppies were born; three died at birth; two were of defective intelligence; one grew up, but was defective in intelligence and nervous organization. This one was coupled with a healthy dog; of this union three puppies were born; one died of marasmus. The other two were congenitally defective, having atrophy of hind legs. One of the conclusions drawn was that the degeneration from alcohol was more prominent in the second generation than the first; also that alcohol used by the mother always produced defective offspring.

A point of interest in this connection is the etiology of dipsomania. The best authorities now agree that, while exceptionally dipsomania may arise from traumatism or alcoholism, the great majority of cases are traced to an insane or intemperate parent or parents. It is an hereditary, not an acquired neurosis.

It will be of interest to record further the results of chronic alcoholism in the lower animals, produced by experimenters with the view of determining the pathological lesions of alcohol. And none have been more zealous than the French in this direction; and of these investigators none more prominent nor painstaking than M. Magnan. We will quote therefore extensively from his work on "Alcoholism,"<sup>3</sup> a most valuable and classical work, and the best in my experience on this special subject.

"M. Tardieu has found meningeal hæmorrhages in persons dying

<sup>3</sup> "On Alcoholism and the various Forms of Alcoholic Delirium, and their Treatment." Dr. V. Magnan, Physician to St. Anne Asylum, Paris; Laureate of the Institute, etc.

in a state of intoxication. These are less frequent in animals, and this is the reason why pachy-meningitis due to the prolonged action of alcohol is rarer in animals than in man."

Magnan.—"That in dogs, even at the end of two months of alcoholic poisoning, the liver undergoes fatty degeneration. A microscopic section shows the cells have lost form, are swollen, round, infiltrated with granules and drops of fat."

M. Prupier notes the effect on a fowl to which absinthe had been given as a drink ten months. "The liver is hard, resistant, lessened in volume, has irregularities on its two surfaces, numerous whitish depressions, the intermediate parts of a reddish brown color. The microscope shows dilatation of vessels at periphery of lobules, filled with granules; extreme compression and degeneration of hepatic cells."

In another experiment a fowl was subjected to the action of red wine for ten months. "The liver is of a clear yellow color, soft, pasty, and oils the blade of the scalpel. Microscope shows cells enlarged and rounder than normal, filled with granules resembling those in parenchymatous inflammation at its beginning; here and there large fat drops."

A fowl was given white wine under similar conditions. "The liver is of good color, but is shriveled on its lower surface and borders. Microscope shows dilatation of vessels, which appear three or four times the normal size when compared with the cells which have undergone atrophic degeneration. A rabbit was subjected to alcohol. The liver shows nothing as regards capillary net-work; the cells are altered and contain two or three nuclei; around bile ducts there is an increase of connective-tissue nuclei. M. Prupier concludes that absinthe affects primarily the stroma without producing new connective tissue or sclerosis of walls of vessels. This marked new growth has not been confirmed. As for red and white wine and alcohol, their injurious effect is seen rather in the plasma and hepatic parenchyma."

Alcohol would seem to produce hepatic steatosis, but not to the exclusion of sclerosis.

A prolonged period of alcoholic intoxication, and consequent irritation, might provoke sclerosis. In the same animal, with fatty degeneration of liver, are found irritative lesions, such as pachymeningitis, sclerosis of posterior columns of spinal cord, thickening and opacity of arachnoid and pia mater, milky patches in pericardium—all these at the same time.

"The kidneys, like the liver, undergo beginning fatty degeneration. The surface is smooth and even; the cortical substance and prolongation between the pyramids of Malpighi show a well-marked yellowish tint, with small striations of a deeper color. The microscope shows tubuli slightly swollen, cloudy, filled with granular and fatty epithelium."



M. Ruge mentions adhesion of capsule to renal substance in four cases; in three cases fatty degeneration of the heart. Magnan has seen traces of pericarditis: "The coats of the stomach in dogs who take alcohol mixed with food, are not sensibly thickened; but the mucous membrane is injected, rarely ulcerated."

When alcohol is taken without food, and directly injected by œsophageal tube or by fistula, traces of violent gastritis are seen; in one case the stomach was shriveled and thickened, and the surface of the reddish-brown mucous membrane was lined with a layer of thick, sticky, glairy mucus streaked with blood. On cleansing with a stream of water, small ulcerations with irregular borders were seen; in some places cicatrices appeared as irregular grayish plates. In the mucus were found infiltrations of blood, some in layers, others in small spots. In the same dog, the cord is not injected and appears normal; a grayish tint is seen on the posterior columns, more marked on lower third, where it has the form of a triangle with the base directed backwards on each side of the posterior median fissure; In the same locality a slight grayish tint in the anterior columns on each side of commissure; Magnan has noted the same condition in a man where chronic alcoholism terminated in general paralysis.

Kremiansky, in dogs who were given alcohol four weeks, noticed pachymeningitis.

M. Neumann observed the same fact, but also that it did not exist sometimes in a more prolonged use of alcohol. Magnan found slight infiltration and slight thickening of arachnoid and pia mater, but no false membranes of dura mater. Others, slight dilatation of vessels of dura or simple injection or œdema of pia.

This diversity is explained by Magnan as due in some cases to a meningeal hæmorrhage during drunkenness, a hæmorrhagic pachymeningitis; but while this accounts for the existence of new membranes in some dogs, Magnan asserts "that pachymeningitis may come on without pre-existing hæmorrhage in certain nervous affections and chronic alcoholism."

We will close this testimony with the result on a terrier dog, two months old; vigorous; weighing thirteen pounds. On alcoholized diet, more or less continuous for nearly six months, an occasional rest being given.

*Autopsy.*—Cerebral dura mater slightly injected. No false membranes. Arachnoid and pia œdematous at base. Rosy tint over interpeduncular space. Membranes separate easily everywhere. Section of hemispheres show fine stippling. No distinct hæmorrhage. Surface of ventricles injected. Abundant vascular ramification on upper surfaces of optic thalamus and corpus striatum, the ependyma being slightly thickened. On section, no deep lesions.

*Spinal dura*, normal; arachnoid and pia injected, especially lower part of dorsal region. Sections of cord show marked injection of gray

matter. No gelatinous tint in columns. No microscopic change.

*Lungs*.—Large marblings of a pale rose or black red, as in bronchopneumonia. Carnification of deep red portion; incompressible; non-crepitant, sinks in water. Right lung, at base, shows grayish points; bronchi opened showed viscid mucus mixed with blood.

*Heart*.—Right cavities distended with liquid blood mixed with black clots. Left cavities, no change.

*Visceral Pericardium* has opaline tint, milky over coronary arteries, particularly at base.

*Liver*.—Yellowish; deep colored points, which microscope shows are seat of well-marked fatty degeneration.

*Kidneys*.—Yellowish in cortical substance and between pyramids.

*Spleen*.—Normal.

*Stomach*.—Several small clots.

*Mucous Membrane*.—Viscid, very thick, adherent mucus. Membrane does not show any ulcerations."

We have thus quoted extensively from these French experimenters that others may be encouraged to follow similar researches with regard to the "pathological effects of alcohol" in animals, with the advantage of improved pathological knowledge and modern appliances; for these investigations demonstrate not only that researches as to the effects of alcohol can be satisfactorily conducted in the lower animals, but they also corroborate what has been demonstrated to be the effects of chronic alcoholism on procreation in the human species, as well as its other pathological effects.

Alcohol acts not only indirectly through the blood as an irritant, provoking fibrosis or other tissue changes, "but on the alimentary canal, particularly the stomach. The local effects of habitual doses of concentrated alcohol are seen in the permanent congestion of the blood vessels, exaggerated or vitiated secretions from the gastric glands, and ultimately a degenerative change in the structure of the submucous tissues, which consists in the disappearance of characteristic secreting structures and hypertrophic exaggeration of fibrous tissue."<sup>4</sup>

The effect of alcohol upon muscular or other tissue, producing fatty degeneration, is similar in this respect to the action of phosphorus, arsenic, or other poisons. Fatty degeneration of the pancreas from alcoholism shows<sup>5</sup> "the glandular parenchyma has partially or entirely disappeared; it may be replaced by adipose tissue, which is developed in the fibrous stroma of the organ around its vessels and glandular ducts." In some instances the acini or characteristic gland structure is lost entirely and replaced with fatty tissue.

But the most marked evidence of the deteriorating effects of alcohol is seen in its action on the nervous system. "It is clear that the ner-

<sup>4</sup> It must be noted that the autopsies in cases of chronic alcoholism in man represent a *longer duration* of the action of alcohol than in animals.

<sup>5</sup> "Cornil and Ranvier." Path. Hist. Shakespeare.



vous centres, independently of the ill effects on their nutrition of the blood changes, have a certain chemical attraction for alcohol, which accordingly are found in their tissue.

The characteristic changes which have been observed in the brain, medulla oblongata, etc., of confirmed drinkers, consists essentially of a peculiar atrophic modification by which the true elements of nervous tissue are partially removed; the total mass of nervous matter wastes, serous fluid is effused into the ventricles and the arachnoid, while simultaneously there is a marked development of fibrous tissue, granular fat, and other elements which belong to a low order of vitalized products."<sup>6</sup>

From these conditions arise vaso-motor paralysis, with all the results that follow a defective supply of blood and an impaired circulation, tending to local stasis. Moreover, if we exclude traumatism, there is not any disease of the nervous system resulting from other causes than alcoholism, at least with few exceptions that alcohol cannot produce—alcoholic neuritis, alcoholic anæsthesia, general paralysis, serous apoplexy, etc., and those cerebral conditions from which arise the acute and chronic forms of mental derangement. The nerves of special sense are not exempt. "The abuse of alcoholic stimulants has been said to be the cause of amaurosis, and, as a proof of this, the fact has been adduced that the affection has been arrested or even cured by completely giving up the habit of drinking" (Sichel). "This much is certain, that amblyopia occurs in great misproportion among habitual drinkers. It is generally first seen as night-blindness, but soon becomes constant, and gray atrophy of the nerve is recognized by the ophthalmoscope" (Pagenstecher).

"One point of interest in this connection, relating to the action of alcohol on the nervous system, is the theory advanced by writers on this subject, and it is a very plausible one: that the degeneration of all tissue in cases of alcoholism is due primarily to the action of alcohol on the nervous centres, and through these, by vaso-motor disturbance or impaired reflex action, upon the organs or tissues which these nerve centres, or vessels influenced by them, supply." But it would seem, while regarding this as the prime cause of alcoholic degeneration, we could not ignore the fact that the blood itself was in chronic alcoholism much deteriorated as to its quality and retarded as to its circulation, and, moreover, that it contained a chemical irritant. The limits of this paper will not permit us to consider in detail all the pathological changes due to alcohol. It affects all the tissues of the body; even the bones are not exempt.

We have therefore generalized our statements and taken a view over the whole field, rather than endeavored to carry out and elaborate any special line of thought. Our object has been to demonstrate that there is abundant material for the pathologist and the microscopist to

<sup>6</sup> "Chronic Alcoholism." Anstie.

investigate, and a neglected but nevertheless a rich field for medical research. How little progress has been made in the study of the pathology of chronic alcoholism and the diseases incident to alcoholism. The lens of the microscopist has been focussed on the microbes of tuberculosis, charbon, anthrax, cholera, and leprosy; cultures of various bacteria have been developed, and the diseases themselves reproduced in the inferior animals from culture inoculations. The whole scientific world stands in daily expectation of new discoveries. Antisepsis, based on bacteriology, has revolutionized medicine and surgery, and has rendered the apparently impossible not only possible but an absolute certainty.

Alcohol has not any microbe, but the grand total of its mortality will exceed the combined effect of all the bacteria that have ever passed the microscopic field or developed in the culture tube of the bacteriologist; and yet while in all other diseases pathological research, both gross and microscopic, seems almost to have exhausted itself, where is there an authentic work upon the "Pathological Changes of Chronic Alcoholism" in the English or Continental languages that we can resort to for information? It is hoped that the directors of laboratories will turn their appliances for pathological research in this direction also, and that the result will be an American work on "The Pathological Changes of Chronic Alcoholism," and that the whole study of the action of alcohol on the blood and tissues of the body as a disease-producing agent will be not fragmentary as in the past, but placed on a substantial basis. In 1887, Dr. H. F. Formad, at a stated meeting of the "Philadelphia Pathological Society," presented "an analysis of two hundred and fifty autopsies on drunkards, illustrating the most prominent anatomical lesions of chronic alcoholism." A most notable international congress was held in London, July, 1887. Prominent delegates from the scientific centres of every nationality were present. It was a purely medical congress, and the papers presented were on medical topics bearing directly on the subject—alcoholism. In the same year there was a similar gathering at Zurich, Switzerland. At the present time "The London Pathological Society" are debating the relation of alcohol to disease. Pathological specimens will be presented and a discussion follow. Nor are the medical organizations of other countries inactive, or the foreign and American medical journals indifferent on the relation of alcohol to disease. There seems to be a general interest throughout the medical centres of the civilized world on this subject.

In view of all this and with the object of exciting further interest in this important subject in the United States, the "American Association for the Study and Cure of Inebriety" have offered an award for the best essay on "The Pathological Changes of Chronic Alcoholism Capable of Microscope Demonstration."

The pages of the *Journal of Inebriety*,<sup>7</sup> the organ of the Society, will always be open to papers, reports of cases or discussions bearing on this subject and kindred medical topics.

Let us hope that the ensuing year will open as auspiciously as the one that is now passing away, and the records of medicine at its close will show much valuable information gathered in this hitherto neglected field.

<sup>7</sup> "Journal of Inebriety." T. D. Crothers, Editor, Hartford, Conn.